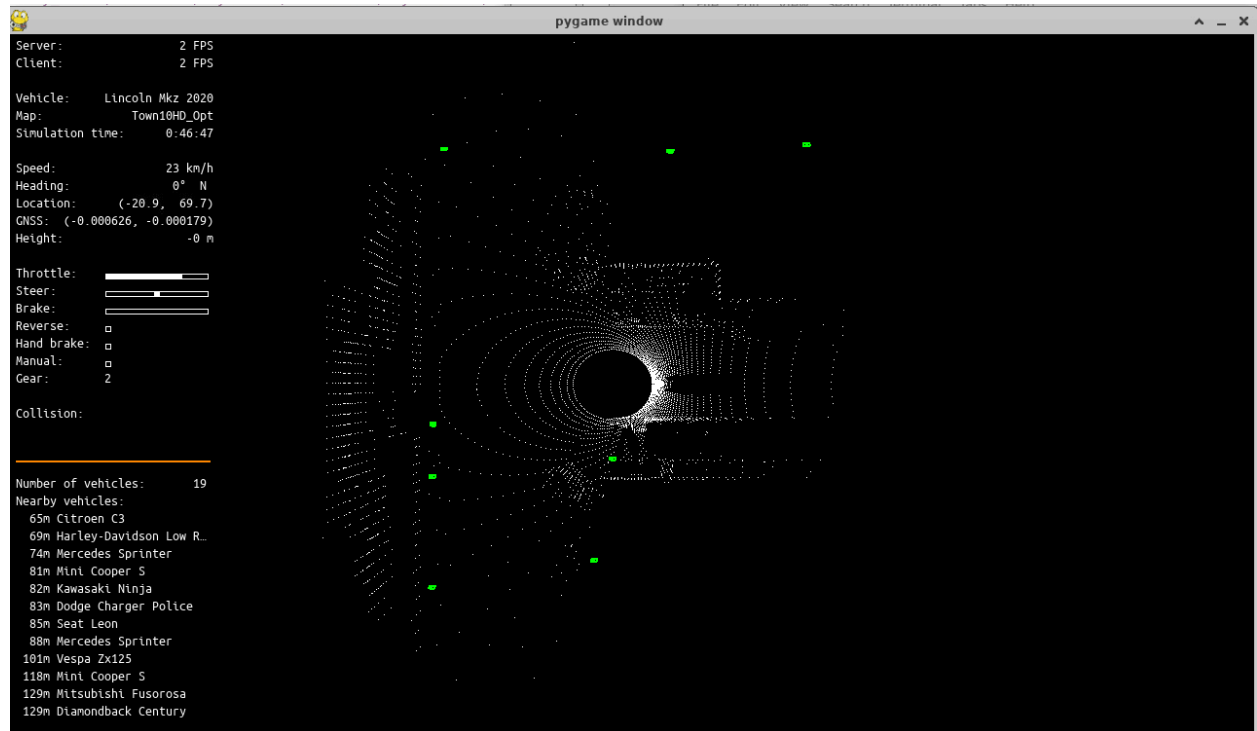


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EE 260C

## Lab 1 Report

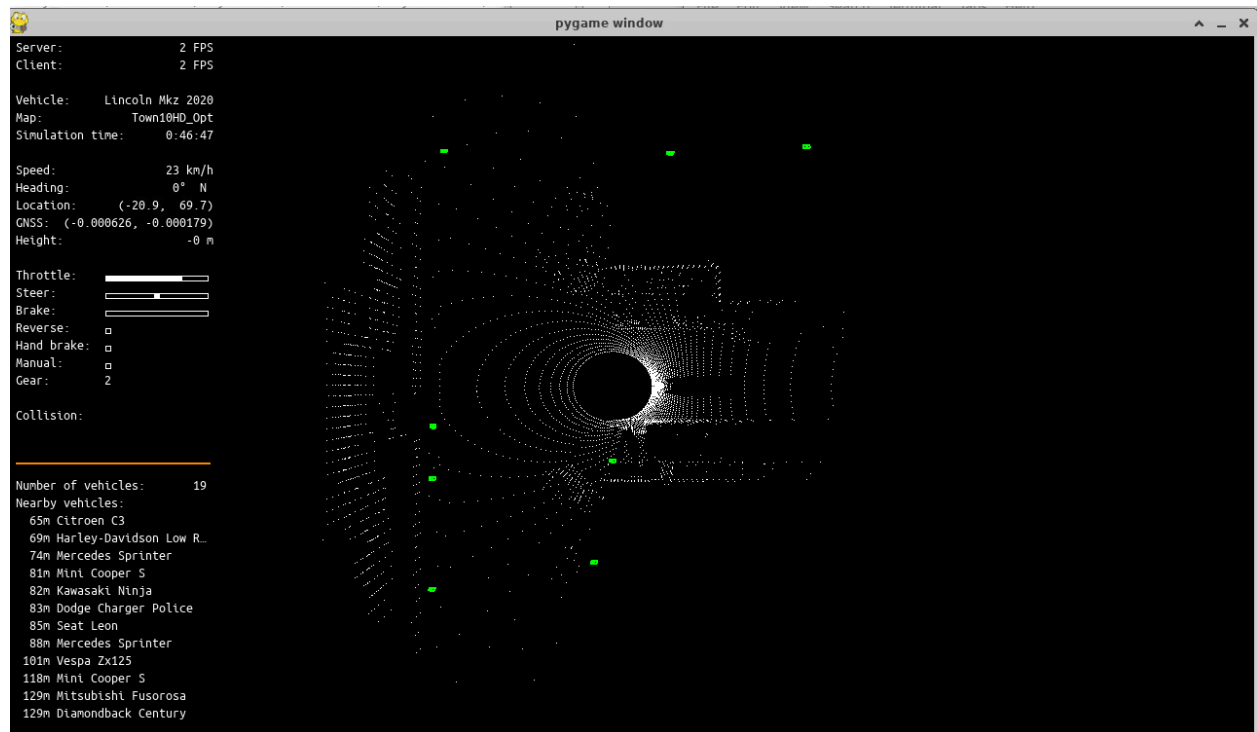
### Part 1

Was able to set the environment and run both `generate_traffic.py` and `automatic.py`



## Part 2

I want to use PointPillar so I use LiDar as my primary sensor.



Lidar point BEV with ground truth bounding boxes.

## Part 3

For the pre-trained model, I was able to install mmdetection3d and demo-run inference of the Pointpillar model using the Kitti dataset.

I was able to understand the input format of the model which is a bin data format that includes x, y, z, and intensities of each point.

I tried to convert the numpy ndarray format of the sensor data to .ply and then to .bin but later found out I could feed the lidar sensor\_data directly to the inference function.

But then I ran into dependencies issues.

I tried to solve it by reinstalling the environment and dependencies multiple times and also running pdb trace to track down the bug. Even though I have learned a lot about Python, Carla, and openmimlab environments along the way, I wasn't able to resolve the issue. If I activate openmimlab environment, the model runs fine. But when I ran it in Carla's environment where mmdet3d is installed as a package, I ran into the error below.

```
000008.json
~/carla/PythonAPI/lab-1-perception-Hungn252/mmdetection3d/outputs/preds

1 [{"labels_3d": [0, 0, 0, 0, 0, 0, 0, 0, 0, 0], "scores_3d": [0.9750428795814514,
0.9681780338287354, 0.9457294344902039, 0.8904330730438232, 0.8889619708061218,
0.7711431980133057, 0.7554051280021667, 0.7057909369468689, 0.5796414613723755,
0.44160714745521545], "bboxes_3d": [[14.7586030960083, -1.053900957107544, -1.5589464902877808,
3.7562646865844727, 1.606018304824829, 1.558731198310852, -0.3132154941558838],
[6.43773889541626, -3.867872476577759, -1.735586404800415, 3.1476645469665527,
1.4599915742874146, 1.4284664392471313, -0.29982995986938477], [8.112312316894531,
1.216991901397705, -1.6339919567108154, 3.666219472885132, 1.5731351375579834,
1.5916659832000732, 2.8161721229553223], [20.169775009155273, -8.430985450744629,
-1.6690070629119873, 2.3816397190093994, 1.5175740718841553, 1.5693763494491577,
-0.3255244493484497], [33.455814361572266, -7.0358734130859375, -1.337639570236206,
4.213878154754639, 1.7446836233139038, 1.6697633266448975, 2.8285622596740723],
[55.62163162231445, -20.328744888305664, -1.377049446105957, 4.370460033416748,
1.73589289188385, 1.7066905498504639, 2.8503384590148926], [3.638394832611084,
2.737973690032959, -1.6890835762023926, 3.7203476428985596, 1.5819814205169678,
1.51776123046875, -0.2305583953857422], [25.040599822998047, -10.156489372253418,
-1.6326427459716797, 3.7391443252563477, 1.6084972620010376, 1.4840397834777832,
-0.3298999071121216], [28.725465774536133, -1.5524342060089111, -1.2016969919204712,
3.693882703781128, 1.5429909229278564, 1.5609301328659058, 1.241531491279602],
[40.87091064453125, -9.748929977416992, -1.3667993545532227, 3.833237648010254,
1.653005838394165, 1.5704081058502197, -0.2881338596343994]], "box_type_3d": "LiDAR"]}]
```

The label file generated from Kitti dataset

```
user@rtx-007: ~/carla/PythonAPI/lab-1-perception-Hungn252
File Edit View Search Terminal Tabs Help

user@rtx-007: ~/carla/PythonAPI/lab-1-p... x user@rtx-007: ~/Desktop x + v

) at 0x7f1f7e306d00>
eval_ann_info: None
gt_pts_seg: <PointData(

META INFORMATION

DATA FIELDS
) at 0x7f1f7e306e80>
) at 0x7f1f7e306cd0>, 'inputs': {'points': tensor([[ 2.1554e+01,  2.8000e-02,  9
.3800e-01,  3.4000e-01],
[ 2.1240e+01,  9.4000e-02,  9.2700e-01,  2.4000e-01],
[ 2.1056e+01,  1.5900e-01,  9.2100e-01,  5.3000e-01],
...,
[ 6.3150e+00, -3.1000e-02, -1.6490e+00,  2.9000e-01],
[ 6.3090e+00, -2.1000e-02, -1.6470e+00,  2.9000e-01],
[ 6.3110e+00, -1.0000e-03, -1.6480e+00,  3.2000e-01]]))})
(openmmlab) user@rtx-007:~/carla/PythonAPI/lab-1-perception-Hungn252$ mim list
Package      Version      Source
-----
mmcv         2.1.0       https://github.com/open-mmlab/mmcv
mmdet        3.2.0       https://github.com/open-mmlab/mmdetection
mmdet3d      1.4.0       https://github.com/open-mmlab/mmdetection3d
mmengine     0.10.5      https://github.com/open-mmlab/mengine
(openmmlab) user@rtx-007:~/carla/PythonAPI/lab-1-perception-Hungn252$
```

## Package setup

```
(conda) user@rtx-007:~/carla/PythonAPI/lab-1-perception-Hungn252$ python test.py
/home/user/miniconda3/envs/carla/lib/python3.7/site-packages/mmdet3d/models/dense_heads/anchor3d_head.py:95: UserWarning: dir_offset and dir_limit_offset will be depressed and be incorporated into box coder in the future
  'dir_offset and dir_limit_offset will be depressed and be '
Loads checkpoint by local backend from path: hv_pointpillars_secfn_6x8_160e_kitti-3d-car_20220331_134606-d42d15ed.pth
Traceback (most recent call last):
  File "test.py", line 25, in <module>
    model = init_model(config_file, checkpoint_file)
  File "/home/user/miniconda3/envs/carla/lib/python3.7/site-packages/mmdet3d/apis/inference.py", line 107, in init_model
    torch.cuda.set_device(device)
  File "/home/user/miniconda3/envs/carla/lib/python3.7/site-packages/torch/cuda/__init__.py", line 326, in set_device
    torch._C._cuda_setDevice(device)
AttributeError: module 'torch._C' has no attribute '_cuda_setDevice'
```

## Error Code

Analyze:

This lab was challenging. I learned a lot about how virtual environments and tools needed in simulating self-driving stack work together. The setup part is harder than I thought it would be. The attached files include the results I got from running demo inference in different formats.